

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
26 August 2004 (26.08.2004)

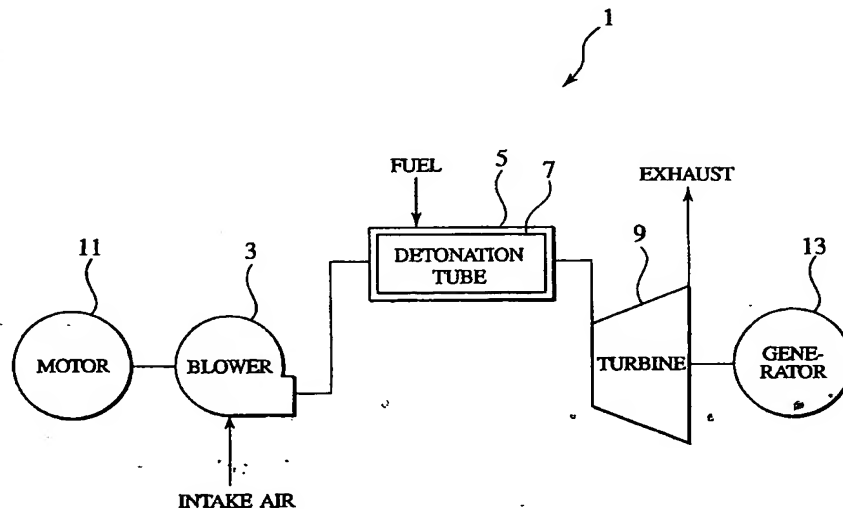
PCT

(10) International Publication Number
WO 2004/072451 A1

- (51) International Patent Classification⁷: **F02C 5/10**
- (21) International Application Number: **PCT/JP2004/001426**
- (22) International Filing Date: 10 February 2004 (10.02.2004)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
 2003-033253 12 February 2003 (12.02.2003) JP
 2003-033301 12 February 2003 (12.02.2003) JP
 2003-144087 21 May 2003 (21.05.2003) JP
 2003-424454 22 December 2003 (22.12.2003) JP
- (71) Applicant (for all designated States except US): Ishikawa-jima-Harima Heavy Industries Co., Ltd. [JP/JP]; 2-1, Ohtemachi 2-chome, Chiyoda-ku Tokyo, 1008182 (JP).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): MURAYAMA, Motohide [JP/JP]. YAMAWAKI, Shigemichi [JP/JP]. TOH, Hidemitsu [JP/JP]. KOBAYASHI, Hideo [JP/JP].
- (74) Agents: MIYOSHI, Hidekazu et al.; 9th Floor, Toranomon Daiichi Building, 2-3, Toranomon 1-chome, Minato-ku Tokyo 1050001 (JP).
- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: PULSE DETONATION ENGINE SYSTEM FOR DRIVING TURBINE



(57) Abstract: A pulse detonation engine system (1) for driving a turbine is comprises a detonation generator section (5) including a detonation tube (7) having a tubular hollow section for permitting detonation to be generated therein during combustion stage of a mixture gas combined with a gas and a fuel, a gas supply section (17) for feeding the gas into the tubular hollow section of the detonation tube (7) at given time intervals, a fuel valve (19) for feeding the fuel into the tubular hollow section of the detonation tube (7) at the given time intervals, and an ignition plug (15) for igniting the mixture gas in the tubular hollow section of the detonation tube (7), and a pulse detonation driven turbine (9) driven directly or indirectly by energy of detonations that are intermittently generated in the tubular hollow section of the detonation tube (7).



Published:

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

PCT/JP2004/001426

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 F02C5/10

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 F02C F02K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>US 6 167 693 B1 (ANDERSON J HILBERT) 2 January 2001 (2001-01-02)</p> <p>figures 5,14,16 column 5, line 29 -column 7, line 18 column 8, line 23 -column 9, line 36 column 10, line 47 -column 11, line 19 column 22, line 28 - line 48 column 25, line 52 -column 26, line 55 --- -/--</p>	<p>1-3, 11, 12, 14-16, 23, 24</p>

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the International filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the International filing date but later than the priority date claimed

"T" later document published after the International filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the International search

26 May 2004

Date of mailing of the International search report

14/06/2004

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3018

Authorized officer

de Rooij, M

INTERNATIONAL SEARCH REPORT

PCT/JP2004/001426

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 062 018 A (BUSSING THOMAS R A) 16 May 2000 (2000-05-16) abstract; figures 1,6,7,15 column 2, line 30 - line 41 column 3, line 64 -column 4, line 11 column 9, line 15 - line 45 column 10, line 53 -column 11, line 47 column 14, line 32 -column 15, line 19 -----	1-3,12, 14-16,24
X	GB 1 048 448 A (HEINZ TEVES;MARTIN TAUSEND; ERNST AUGUST TEVES) 16 November 1966 (1966-11-16) the whole document -----	1,6,9, 13,14, 19,25
X	US 5 513 489 A (BUSSING THOMAS R A) 7 May 1996 (1996-05-07) abstract; figures 3,11,25 column 1, line 33 - line 54 column 4, line 37 -column 5, line 23 column 6, line 7 - line 12 column 9, line 3 - line 14 column 15, line 3 -column 16, line 2 -----	1,10,12, 14,22,24
X	CH 233 945 A (SULZER AG) 31 August 1944 (1944-08-31) figures 3,4 page 1, line 1 - line 25 page 2, line 31 - line 57 page 3, line 70 -page 4, line 5 page 4, line 36 - line 72 -----	1-3, 14-16

INTERNATIONAL SEARCH REPORT

Information on patent family members

PCT/JP2004/001426

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 6167693	B1	02-01-2001	US 5983624 A	16-11-1999
			US 2003000221 A1	02-01-2003
			US 6301872 B1	16-10-2001
			US 2002046560 A1	25-04-2002
US 6062018	A	16-05-2000	US 5513489 A	07-05-1996
			US 5345758 A	13-09-1994
			US 5855827 A	05-01-1999
			US 5901550 A	11-05-1999
			US 5873240 A	23-02-1999
			US 6003301 A	21-12-1999
			WO 9424427 A1	27-10-1994
			US 5353588 A	11-10-1994
GB 1048448	A	16-11-1966	FR 1386026 A	15-01-1965
US 5513489	A	07-05-1996	US 5345758 A	13-09-1994
			US 5855827 A	05-01-1999
			US 5901550 A	11-05-1999
			US 6062018 A	16-05-2000
			US 5873240 A	23-02-1999
			US 6003301 A	21-12-1999
			WO 9424427 A1	27-10-1994
			US 5353588 A	11-10-1994
CH 233945	A	31-08-1944	NONE	

Best Available Copy